

Application Serial No. 10/781,898
Attorney Docket No. 52493.000362

The following is a listing of claims.

1. **(Currently Amended)** A method for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the method comprising:
 - generating an initial population of solutions of portfolio allocations, the generating the initial population of solutions of portfolio allocations including systematically generating the initial population of solutions to substantially cover the a space defined by the competing objectives and the plurality of constraints; and
 - generating an efficient frontier in the space based on the initial population, the efficient frontier for use in investment decisioning; and
 - wherein the generating an efficient frontier in the space based on the initial population includes:
 - performing a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier;
 - performing a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; and
 - fusing the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier.
2. **(Original)** The method of claim 1, wherein the generating the initial population of solutions uses a combination of linear programming and sequential linear programming algorithms.
3. **(Original)** The method of claim 1, wherein the competing objectives include risk and return and the space is a risk/return objectives space.

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4. (Original) The method of claim 3, wherein the space is defined by greater than three dimensions.
5. (Original) The method of claim 1, wherein the initial population of solutions includes multiple initial feasible points.
6. (Original) The method of claim 5, wherein the multiple initial feasible points are generated by solving linear programs.
7. (Original) The method of claim 6, wherein the linear programs utilize randomized parameters.
8. (Original) The method of claim 1, wherein the generating the initial population of solutions of portfolio allocations includes generating portfolios with different combinations of risk and returns values.
9. (Original) The method of claim 8, wherein the generating portfolios with different combinations of risk and returns values are performed by adding additional risk and return constraints to a linear program corresponding to the risk and return objectives.
10. (Original) The method of claim 9, wherein portfolios with substantially all feasible combinations of risk and return values are generated by modifying parameters of the added risk and return constraints.
11. (Original) The method of claim 1, wherein the generating the initial population of solutions of portfolio allocations includes generating portfolios with different combinations of competing values.
12. (Original) The method of claim 11, wherein the generating portfolios with different combinations of competing values are performed by adding additional competing value constraints to a linear program corresponding to the objectives of the competing values.

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13. (Original) The method of claim 12, wherein portfolios with substantially all feasible combinations of the competing values are generated by modifying parameters of the added competing value constraints.

14. (Cancelled)

15. (Currently amended) The method of ~~claim 14~~ claim 1, wherein a dominance filter process is applied on the augmented efficient frontier to create a global efficient frontier.

16. (Original) The method of claim 10, wherein nonlinear risk and return constraints are approximated with linear constraints generated by a sequential linear programming.

17. (Currently Amended) A system for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the system comprising:

a population generation portion that generates an initial population of solutions of portfolio allocations, the population generation portion systematically generating the initial population of solutions to substantially cover ~~the~~ a space defined by the competing objectives, the population generation portion including:

a range value generation portion for varying values of the competing objectives over a range of each competing objective;

a linear program portion, the linear program portion:

solving a linear program, for each of the linear constraints, multiple times by setting a weight vector equal to one of the linear constraints; and

solving the linear program multiple times by setting the weight vector equal to a randomly generated vector; ~~and~~

~~wherein~~ the range value generation portion and the linear program portion;

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performing a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier;

performing a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; and

fusing the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier~~iteratively perform their respective operations until the range of possible values for each competing objective is substantially covered so that an efficient frontier is generated, the augmented efficient frontier being used in investment decisioning.~~

18. (Original) The system of claim 17, wherein the competing objectives include risk and return and the space is a risk/return objectives space.

19. (Original) The system of claim 17, wherein the generating the initial population of solutions of portfolio allocations includes generating portfolios with different combinations of competing objectives.

20. (Currently Amended) A computer readable medium for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the computer readable medium comprising:

a first portion for varying values of the competing objectives over a range of each competing objective;

a second portion, the second portion:

solving a linear program multiple times by setting a weight vector equal to one of the linear constraints; and

solving the linear program multiple times by setting the weight vector equal to a randomly generated vector; and

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wherein the first portion and the second portion iteratively perform their respective operations until the range of possible values for each competing objective is substantially covered so that an efficient frontier is generated, the efficient frontier being used in investment decisioning; and

wherein the generating an efficient frontier includes:

performing a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier;

performing a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; and

fusing the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier.

21. **(Currently Amended)** A method for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the method comprising:

generating an initial population of solutions of portfolio allocations, the generating the initial population of solutions of portfolio allocations including systematically generating the initial population of solutions to substantially cover the a space defined by the competing objectives and the plurality of constraints; and

generating an efficient frontier in the space based on the initial population, the efficient frontier for use in investment decisioning;

wherein the generating an efficient frontier in the space based on the initial population includes:

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performing a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier;

performing a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; and

fusing the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier;

wherein the competing objectives include risk and return and the space is a risk/return objectives space;

wherein the generating the initial population of solutions of portfolio allocations includes generating portfolios with different combinations of risk and returns values;

wherein the generating portfolios with different combinations of risk and returns values are performed by adding additional risk and return constraints to a linear program corresponding to the risk and return objectives; and

wherein portfolios with substantially all feasible combinations of risk and return values are generated by modifying parameters of the added risk and return constraints.